Crop Systems for Arkansas

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CROP SYSTEMS for Arkansas that make for increased food production and increased efficiency in man labor and horse labor are described in the following pages. By the introduction of cowpeas, soy beans, and other legumes, and by second cropping, provision is made for a considerable increase in the number of crop acres that can be farmed by the average family. Thus, two men with a team, who under a cotton and corn system can farm but 33 acres of land, can handle 50 acres and raise 62 acres of crops under a system providing for a 4-year rotation, including (1) cotton with a winter cover crop, (2) cowpeas, (3) oats or wheat followed by cowpeas, and (4) corn.

In each of the cropping systems suggested the crop acreages are calculated for two men and a team, and for light, medium, and heavy soils.

These systems in general apply to all of Arkansas, except the northwestern part, and some of them may be used to advantage in northern Louisiana, northeastern Texas, southeastern Oklahoma, western Tennessee, and the northern half of Mississippi.

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NEED OF BETTER SYSTEMS.

EVERY FARMER decides before each planting season what crops he will plant and the approximate acreage of each, and he bases his estimate of acreage on his previous experience or the experience of some one whose judgment he trusts. But the moment that he attempts to introduce a new crop, and often when he changes the acreages of his old ones, he is at a loss to determine how much he can handle with his labor, teams, and equipment. Many a farmer has lost money by miscalculation in this regard.

At present there is more than the usual changing of plans among Arkansas farmers, and there is a real need for definite information as to how many acres of crops a family and a team should be expected to farm and how the number of acres varies according to the crop system adopted. It is pretty well known in each community how many acres of the standard crops can be farmed per family or per mule, but there is little or no knowledge as to how many acres might be farmed under other systems, and this bulletin is written to give some definite information on this point.

A study of 70 farms in the northern end of Pulaski County, Ark., covering the year 1916, showed that families farmed an average of 33.7 acres of all crops. On 50 farms in Lee and Phillips Counties in eastern Arkansas, they farmed 27.8 acres, while around Magnolia, in southwestern Arkansas, they farmed 36.7 acres. These variations were due partly to the type of farming, partly to differences in crop yields, partly to differences in the type of soil, and partly to other factors.

Families differ, of course, in size, but the average number of hands per family on the farms included in this inquiry was about 2, or one man and a boy, and the average number of work animals per family

also about 2 (with considerable variation, however, in different sections). These averages have been made the basis of this bulletin. The crop systems mentioned have been calculated from labor data gathered from many farms, and the acreages given are such as two men and a team can farm handily, with some exceptions to be noted. These acreages are based on the experience of farmers at Jacksonville, Pulaski County, where average yields are 200 pounds of lint cotton and 20 bushels of corn per acre, and where the soil is neither as easy to till as in the very sandy regions nor as hard as in the silty, clayey soils which abound in the State. In using these figures allowance must be made for variations in type of soil, yield, and other things. (On pages 15 to 18 the acres for each system are given for medium soils in central Arkansas, for silty soils in eastern Arkansas, and for sandy soils in southwestern Arkansas, with yields of cotton and corn for each locality.)

HOW THE SYSTEMS MAY BE ADAPTED TO INDIVIDUAL NEEDS.

The systems here described are believed to be numerous and varied enough to satisfy usual variations in conditions; if one does not fit, another may. In many cases they will be merely suggestive; if the farmer sees one that he thinks is good he may adopt it, or he may modify it to suit his case. There are numberless possible combinations of crops and acreages, but the 10 which are given will probably suffice to illustrate the principles of combination and give ample opportunity for choice.

What may be done with two work animals is fairly indicative of what may be done with any other number of work animals. Thus, other things being equal, the farmer with but one mule can count on covering approximately half the acreage covered by the farmer with a team, while the farmer who is in position to keep three teams at work can count on covering approximately three times that acreage.

In using the figures given in this bulletin for estimating the acreage that may be farmed with a given crew, the number of men available should be taken into account as well as the number of horses or mules. If the number of "hands" varies in marked degree from the number of work animals, some allowance must be made for that fact. Where hands are more numerous than work animals, there is a marked tendency toward a very liberal use of the hoe, and if they are fewer in number the work animals stand idle part of chopping time unless extra hands are hired. Indeed, the average work animal on the farms studied in Arkansas does not work up to the limit of available time even in the busy months of May and June, which means, in part, that the farmer stops the plow part of the time to help out with the hoe, a fact which has greater significance than is apparent on the surface. If a farmer has two work animals, but fewer than two

field hands, or their equivalent in boys or women who do field work, he can not farm the acreages suggested unless he can hire some extra labor. In actual practice each farmer must modify the system adopted so that the crop acres will be in proportion to the labor.

Total farm acreages are not given, since the systems are all figured on the basis of acres of crop land two men and two work animals may be expected to farm. Size of farm would vary according to the percentage of improved land and according to the amount of stock kept and the need for pasture. Under all systems pastures would be needed and these must be large enough to graze the stock that are on the farm. Only actual crop acreages are given here, leaving it to each person to estimate how much more land will be needed for pasture, etc.

In the following systems it is assumed that the soil is one which can be worked with medium ease and that the yields are 200 pounds of lint cotton or 20 bushels of corn per acre. With soils that are hard to till, or when yields are larger, the acreage that two men and a team can handle will be proportionately smaller.

TEN SYSTEMS OUTLINED.

System 1. A COMMON SYSTEM, TWO-THIRDS COTTON AND ONE-THIRD CORN.

The first system to be mentioned, though this does not imply that it is the best, is one in which cotton occupies two-thirds of the cropped area and corn one-third. The acreages of these crops which two men and a team can conveniently farm on Jacksonville soils, with an average yield of 200 pounds of lint cotton and 20 bushels of corn per acre, are as follows:

	Acres.
Cotton	22
Corn[1]	11

This system, with the yields mentioned, would give two hands profitable work 120 to 130 days a year and would keep the team busy 70 to 75 days. During the months of May and June both men would be busy about all the time the average weather would permit, and they would doubtless fall behind their schedule if those months were rainy. Under average conditions, however, the two work animals would be busy less than two-thirds of the available time during these two months. The work of cotton picking could be handled by two average hands, even though they did not get to it as fast as it was ready. They could pick it out by the 20th of November in this latitude, with an ordinary season.

One unfavorable feature of this system is that it provides no hay, though some of the farmers still "pull" fodder and thus get "hay" of a good quality, though at a high cost.

[1] Early-planted corn is assumed in all these systems.

COWPEAS IN THE CORN.

The practice of planting cowpeas between the corn rows is so common that it should be mentioned in this connection. In calculating the various systems the work of picking peas-in-corn was not included. Often they are hogged down and sometimes cornstalks and peas are harvested together for hay. If they are gathered, however, extra labor will be needed, which can be figured on the basis of one day's work for a bushel of peas, or thereabouts. Where there are a number of children in the family both cotton and peas could probably be picked without hiring extra labor, but since the labor of picking peas is so great and since it conflicts with cotton picking, it would seem better for communities to save their peas by machine methods from peas planted alone. If peas are planted between the corn rows it would seem advisable, from the labor standpoint, to graze them off, unless plenty of labor is available. If it is desired to pick them, and if extra labor (in excess of two hands) is not available, the acreage of crops would have to be cut down from the figures given, hence the gain from legume seed saved would be counterbalanced by a decrease in the size of the farm business. If velvet beans are planted instead of cowpeas the beans may be picked without extra labor, because the work can be done after cotton picking is finished.

System 2. A BETTER SYSTEM, HALF COTTON AND HALF CORN.

A crop system which runs less strongly to cotton and which has been practiced by some of the best Arkansas planters, is one in which half of the land is devoted to cotton and half to corn, though in practice a few acres of other crops are grown. The acreages of crops which can be farmed by two men and a team with this system on medium soils are as follows:

	Acres.
Cotton	18
Corn	18
Wheat or oats, followed by cowpeas	4

By cutting down the cotton acreage 4 acres per team as compared with system 1, the corn acreage can be increased by about 7 acres and still leave time to handle about 4 acres of wheat or oats followed by cowpeas. Since early corn is laid by in June, there is time to care for a few acres of oats and cowpeas without conflict with other crops. While there is 4 acres less cotton in system 2 than in system 1, yet there are 44 acres of all crops, counting the peas following oats, compared with 33 acres in system 1. If cowpeas are interplanted in the corn, they can not be picked unless there are more than two hands, but they can be fed off.

It is very likely that the yield of cotton per acre would be greater under system 2 than under system 1.

This system would give two men profitable work 120 to 130 days a year, and a team 85 to 90 days.

System 3. MORE COWPEAS.

There are many Arkansas farmers who believe that system 2 does not go far enough toward diversification, but who nevertheless desire the cotton acreage to exceed that of any other single crop. Such farmers will find the following system a convenient one to follow:

	Acres.
Cotton and winter cover crop	16
Cowpeas planted in May	8
Oats or wheat followed by cowpeas	8
Corn	8
Late Irish potatoes	1

This totals 49 acres of crops on 41 acres of land.

These crops may be arranged in a five-year rotation in which cotton occupies one division of the land for two years, cowpeas one year, oats and cowpeas one year, and corn one year. A winter cover crop should follow the cotton crop, at least that part which precedes cowpeas, because of the considerable growth it would attain in the spring before being plowed under. Under this system work is somewhat crowded in September and October, but some of the cotton could be picked by extra hands.

In this arrangement nearly 40 per cent of the cropped area is devoted to cotton, which is a little less than in system 2.

These crops would give two men profitable work 125 to 135 days a year, and a team 95 to 100 days.

System 4. THE "THREE-YEAR" ROTATION.

Many excellent authorities for years have recommended for Arkansas what is called the "three-year" system of crop rotation, which means that one-third of the cropped area shall be in cotton, one-third in corn, and one-third in oats, followed by cowpeas. The acreage which two men and a team can handle under this system depends somewhat on the order in which crops follow each other. In some cases oats are drilled between the cotton rows, which makes corn follow after oats and cowpeas and precede cotton. In some cases spring oats are planted where cotton grew the year before, in which case the sequence of crops is the same. In still another case the oats follow corn, the cowpeas follow oats the same year, and cotton follows the cowpeas the year after. Planting oats between cotton rows is more practical in the hills than on the bottom lands. Planting in the fall after corn usually means late and inadequate preparation, with much danger of winter killing; but if corn is cut and shocked or put in silos in late August or early September instead of being snapped from the standing stalk, there is ample time to prepare a good seed bed for oats or other fall grain. People who

have never cut and shocked corn seem afraid of damage by the weather, but for the latitude of Arkansas it has been proved many times that the practice is a safe one. If one cuts at the right time and shocks well he may be sure of good results.

Assuming, then, that winter oats follow corn; that the corn is cut and shocked; that cowpeas follow oats the same year; and that cotton follows cowpeas, the acreages that two men and a team can farm will be as follows:

	Acres.
Cotton	13
Corn	13
Wheat or oats, followed by cowpeas	13
Late Irish potatoes	1

This makes a total of 53 acres of crops on 40 acres of land, the cowpeas being a second crop on the oat land.

This system, which has been highly recommended by agricultural authorities, leaves something to be desired from the labor standpoint. It requires too much labor in the month of June; but from other standpoints it is an excellent system.

In this instance an acre of late Irish potatoes has been added to the usual three-crop rotation, late potatoes being chosen because the early crop involves much work in June, the busiest month under this system.

Whether the cowpeas in this system shall be cut for hay, thrashed for seed, hogged down, or harvested partly by one method and partly by another is a question that must be answered according to circumstances. Also it may be debatable whether they should be planted in rows and cultivated or sown broadcast. In calculating the labor for this system it was assumed that the peas were sown broadcast and harvested for hay.

If it is desired to save peas for seed they should be planted in rows, cultivated, cut with a mowing machine, and thrashed with a machine which thrashes them from the entire plant. Such machines are not as common as they ought to be, and there are communities where this plan is not practicable; but if farmers would plant peas in this manner and in the quantity suggested, thrashing machines would soon be provided to handle the business.

This system would give two men profitable work 120 to 130 days a year and a team 95 to 100 days.

System 5. A FOUR-YEAR ROTATION.

The weakness of system 4 is that it requires too much labor in June. This can be remedied by adding another year to the rotation and having a crop of cowpeas that is planted in May and harvested in August. With this modification of system 4, we have the four-year rotation (illustrated on the title page):

	Acres.
Cotton	12
Corn and winter cover crop	12
Cowpeas, planted in May	12
Oats or wheat, followed by cowpeas	12
Sweet potatoes	1
Late Irish potatoes	1

Under this system two men and a team can farm 62 acres of crops on 50 acres of land and be no busier than with system 4. There is only 1 acre less cotton than in system 4, but there are 9 acres more of total crops, a result accomplished by arranging the crops so that the work is well distributed over the year.

FIG. 1.—Left: Rye grown after corn; no fertilizer, no clover. Right: Rye on same land, same stage of growth, seeded after late Irish potatoes that had been fertilized with a crop of crimson clover plowed under and 300 pounds of commercial fertilizer per acre.

A feature of this system which has a bearing on the maintenance or increase of soil fertility is worth considering. The land for the May-planted cowpeas will be broken late (in April and May), hence a winter cover crop preceding the cowpeas would have ample time to make considerable growth before being plowed under. What that winter cover crop should be may be left to circumstances to decide, but crimson clover, bur clover, or the winter grains are suitable for the purpose. (See fig. 1.)

In this system there is no doubt what place oats or other small grain should occupy in the crop sequence, for nothing could be easier or better than to have them follow cowpeas, which are harvested in August. The main rotation would then be as follows:

First year: Cotton followed by a winter cover crop.
Second year: Cowpeas, planted in May, and harvested in August.
Third year: Oats or wheat. Followed by cowpeas.
Fourth year: Corn. (The corn may have cowpeas, soy beans, or velvet beans interplanted, which will furnish feed and serve as a fertilizer for the next year's cotton.)

Under this system there will be an abundance of feed, the surplus of which may be fed or sold as circumstances dictate. If oats is the small grain, it will furnish all the grain needed for the team and some for sale. The corn, with cowpeas or velvet beans or soy beans between, can all be transformed into pork if that seems the best method of disposal. The cowpeas that follow oats or wheat may be hogged down or saved for seed, while the cowpeas that ripen in August will furnish all the hay needed and perhaps some early feed for hogs. The sweet potatoes and late Irish potatoes will furnish abundance of food for the family and some for sale.

Considering the winter cover crop and the large area of cowpeas in this rotation, 12 acres of cotton probably will produce as many bales as the 13 acres in system 4 and nearly or quite as many as the 18 acres in system 2. The lower acreage of cotton will be compensated for by higher yields of cotton and by increased acreages of other crops.

Under this system two men will be busy at profitable work 120 to 130 days a year, and the team 100 to 105 days, not including baling hay and marketing feed crops.

System 6. INCLUDING LESPEDEZA.

System 6 is substantially the same as system 5, except that lespedeza (Japan clover) takes the place of the cowpeas that follow oats or wheat. Also the Irish and sweet potatoes are left out, at least so far as market crops are concerned. The acreages which two men and a team can farm under this system will be as follows:

	Acres.
Cotton and winter cover crop	14
Cowpeas planted in May	14
Oats or wheat followed by lespedeza	14
Corn	14

This makes a total of 70 acres of crops on 56 acres, the lespedeza being a second crop after oats or wheat.

This system is not as generally applicable as system 5, because there are many poor upland soils where lespedeza does not grow

tall enough for a hay crop. It is applicable, however, to creek and river bottom lands, at least so far as lespedeza is concerned, and to the silty soils of eastern Arkansas. Moisture is the important thing in making a crop of lespedeza and if that is plentiful it can be grown for hay even on the poorer lands.

By substituting lespedeza for cowpeas, following oats or wheat, it is possible to farm a larger area with the same crew and equipment, because of the fact that lespedeza requires no work in June, whereas cowpeas following oats or wheat must be planted on freshly broken land—land that must be broken in June and early July. The net effect of this change on the acres that can be farmed by two men and a team is that they can handle 70 acres of crops raised on 56 acres of land compared with 62 acres of crops on 50 acres of land in system 5.

Lespedeza seed has been so expensive for several years that it is possible that to save the seed alone and let the rest of the crop go to the land as a fertilizer might pay very well.

In this system, as in system 5, there would be more than enough oats for the team, hence the corn with peas or other legume could be made into pork. Lespedeza could be marketed as hay or seed or fed to cattle. The cowpeas planted in May could be made into hay, or part of them could furnish early feed for hogs.

Such systems as this, as well as systems 3, 4, and 5, would involve the use of grain binders and thrashing machines. Farming conditions would be better if such machines were more numerous in many parts of the cotton region, and such crop systems would tend to increase their numbers.

Under this system two men would be busy at profitable work 120 to 130 days a year, and the team 105 to 110 days a year, not including the work of baling hay and marketing feed crops.

System 7. A MIXED SYSTEM.

System 7 may be called a mixed system, with a considerable variety of crops, though cotton leads, occupying about 30 per cent of the cropped area. Under average conditions two men and a team can farm, under this system, the following acreages of various crops:

	Acres.
Cotton	14
Corn	10
Oats or wheat followed by cowpeas	8
Cowpeas planted in May	8
Peanuts	4
Sweet potatoes	1
Late Irish potatoes	1

This makes a total of 54 acres of crops on 46 acres of land. This system is irregular in its acreages of crops, yet it can easily be

arranged into a three-year rotation with an odd acre outside the rotation.

May and June are busy months under this system, as are September and October. The May and June work can be handled by two hands, however, provided the hoeing is not excessive, and it will not be excessive if proper implements are used and the weed management is good.

The October work is fairly heavy, but it can be managed by hiring extra labor for a few days or by throwing some of the October work into November, such as gathering corn or picking cotton. Corn is ordinarily gathered in October, but it may be cut and shocked in August, and may then stand till November before it is husked, a plan that reduces the October work and permits early preparation for fall grains.

This system, like several of the preceding, provides feed for the stock and food for the family, and some surplus for sale. Corn, peas, peanuts, and sweet potatoes are preeminently desirable as hog feed, and any surplus of these things can be utilized in making pork.

These crops will keep two men busy at profitable work 130 to 140 days a year, and a team 100 to 105 days, not including the work of baling hay and marketing feed crops.

System 8. SOY BEANS ADDED.

The soy bean crop is one of the promising new crops for North and South and one particularly desirable on account of its high content of oil and protein, or fat and muscle making food. It is already a considerable crop in eastern North Carolina, where machines are used for harvesting the crop for seed. The crop grows well in all the cotton States, but in most localities the methods of saving seed are still crude. System 8 includes soy beans as one of the important crops, and under this system two men and a team may be expected to handle crops as follows:

	Acres.
Cotton and winter cover crop	10
Cowpeas planted in May	10
*Wheat or oats, followed by cowpeas	10
Soy beans	10
Corn	10
Early Irish potatoes	1
Late Irish potatoes	1

This makes 62 acres of crops on 51 acres of land, the wheat or oats being followed by cowpeas the same year, and the early Irish potatoes being followed by a late crop.

Two of these crops may be followed by winter cover crops without necessitating the hiring of extra labor, and these may be sown in September in both the cotton and the soy beans.

If a leguminous cover crop follows cotton, and if corn is interplanted with cowpeas or velvet beans, every acre of land except the 1 acre occupied by Irish potatoes will have a legume on it every year, which means a gain in soil fertility.

This system is well adapted to the production of live stock, especially hogs, though, of course, extra pasture will be needed in all these systems if many animals are kept. Soy beans may be turned into pork or saved for hay or seed. This system, as well as several that precede it, would produce as much cotton as the average family now raises and possibly more, would provide plenty of feed and food, and would furnish a variety of products for sale. Whether to sell the feed products direct or through animals is a question that must be answered differently under different conditions, but if there should be a general movement toward such systems as 3, 4, 5, 6, 7, and 8, some of the feeds must go into live stock to prevent glutting the feed market.

Under this system two men will be busy at profitable work 120 to 130 days, and the team 105 to 110 days, not including baling hay and marketing feed crops.

System 9. NO COTTON.

All the systems described hitherto have had cotton as the principal money crop, but in this system there is none. Cotton is a good money crop and most southern farmers should grow it, but there are a few men here and there who prefer not to grow it, and these may be interested in such a system. System 9 is less intensive than any of the others here suggested, being based almost entirely on grain and hay crops, which require a small amount of labor. It can not be recommended, however, outside of the lespedeza area. The acreages of crops for this system are as follows:

	Acres.
Corn and winter cover crop	20
Cowpeas planted in May	20
Oats or wheat followed by lespedeza for hay, seed, or both	20
Volunteer lespedeza for hay	20
Early Irish potatoes	2
Late Irish potatoes	2

This is a total of 104 acres of crops on 82 acres of land. Twenty acres of lespedeza is a second crop, and 2 acres of late Irish potatoes follow the early crop on the same land.

It would lighten the October work in this system and would facilitate the planting of a winter cover crop after corn if the latter crop were cut and shocked or part of it put into the silo; and a cover crop is particularly desirable because, being followed by cowpeas, it has time to make a heavy growth before being plowed under.

These crops would prove excellent for a dairy farmer using hogs as a side line, or would be good crops to market if care were taken

to get a good quality of grain and hay. However, if system 9 were adopted by dairymen the crop acres might have to be scaled down, since dairymen can not put in as many hours in the field as other farmers.

The Irish potatoes, though occupying a small area, would doubtless add considerably to the farm income, and the legumes would have a very beneficial effect on the fertility of the soil.

All of these crops would keep two men busy at profitable work 130 to 140 days a year, and a team about the same time, but this does not include baling hay and marketing hay and grain. If all these crops were marketed as such, the system would keep the men and the team busy much of the winter as well as all summer.

System 10. INTRODUCING ALFALFA.

This, the last system to be described, is the only one with alfalfa, and of course is applicable only to those lands on which that crop can be grown. Alfalfa is a very productive crop, but it is often a difficult problem to plan a crop system including alfalfa so that there will not be too much work on hay at times when other work is pressing. The following, however, is suggested as a practical system for two men and a team:

	Acres.
Cotton	12
Corn	12
Cowpeas, planted in May	6
Sorghum hay, planted May 1	6
Wheat or oats followed by cowpeas	6
Alfalfa	6
Early Irish potatoes	1
Late Irish potatoes	1

This amounts to 56 acres of crops on 49 acres of land and is a more intensive system than the foregoing.

Cotton is the principal money crop, but alfalfa may also be a money crop of importance, and even if the alfalfa is sold there would still be an abundance of feed for stock and perhaps enough to produce some animals or animal products for sale. The Irish potatoes would also bring a little money. The alfalfa could not, of course, be used in a short rotation, but should remain on the land as long as it does well.

These crops would keep two men busy at profitable work 125 to 135 days a year and the team 105 to 110 days, without considering the work of baling hay and marketing hay and grain crops. These might, of course, be fed on the farm, in which case the work of marketing may be practically ignored.

SUMMARY OF THE SYSTEMS, WITH ACREAGES FOR LIGHT, MEDIUM, AND HEAVY SOILS.

The acreages specified in the foregoing descriptions of the various systems suggested are for central Arkansas, where the soil is moderately easy to till. The systems as outlined, however, apply to the greater part of the State, with such changes in acreages as are made necessary by differences in soil. In the northeast they would have to be modified somewhat, and in the northwest they do not apply at all. In eastern Arkansas the soils are heavy and the acreages that can be covered by a man and team are reduced accordingly, while in southwestern Arkansas the soils are very light and the acreages that can be covered are correspondingly larger. In the following summary of these crop systems the acreages are given for each of the three sections—for light, medium, and heavy soils.

Some of these systems will be found practicable in northern Louisiana, northeastern Texas, southeastern Oklahoma, western Tennessee, and the northern half of Mississippi.

FOR SOUTHWESTERN ARKANSAS.

Crop system for sandy soils easy to till; two men and two work animals.

[Cotton yield, 225 pounds lint cotton per acre; corn yield, 20 bushels per acre.]

System.	Crop areas.	Total land in crops.	Second or double crops.	Total of crops.
	Acres.	*Acres.*	*Acres.*	*Acres.*
System 1:				
Cotton	23			
Corn	12	36	.....	36
Early Irish potatoes	1			
System 2:				
Cotton	19			
Corn	19	43	5	48
Oats or wheat followed by cowpeas	5			
System 3:				
Cotton and winter cover crop	17			
Cowpeas planted in May	9			
Oats or wheat followed by cowpeas	9	45	9	54
Corn	9			
Late Irish potatoes	1			
System 4:				
Cotton	14			
Corn	14	43	14	57
Oats or wheat followed by cowpeas	14			
Late Irish potatoes	1			
System 5:				
Cotton and winter cover crop	13			
Cowpeas planted in May	13			
Oats or wheat followed by cowpeas	13	54	13	67
Corn	13			
Sweet potatoes	1			
Late Irish potatoes	1			
System 6:				
Cotton and winter cover crop	15			
Cowpeas planted in May	15			
Oats or wheat followed where feasible by lespedeza	15	60	15	75
Corn	15			
(It is doubtful whether lespedeza is suited to this region.)				

Crop system for sandy soils easy to till; two men and two work animals—Continued.

System.	Crop areas.	Total land in crops.	Second or double crops.	Total of crops.
System 7:	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Cotton	15			
Corn	11			
Oats or wheat followed by cowpeas	8			
Peanuts	4	50	8	58
Cowpeas planted in May	10			
Sweet potatoes	1			
Late Irish potatoes	1			
System 8:				
Cotton and winter cover crop	11			
Cowpeas planted in May	11			
Oats or wheat followed by cowpeas	11			
Soy beans	11	56	12	68
Corn	11			
Early Irish potatoes followed by late Irish potatoes	1			
System 9 (not applicable to this region).				
System 10 (not applicable to this region).				

FOR CENTRAL ARKANSAS.

Crop systems for medium soils, or those tilled with moderate effort; two men and two work animals.

[Cotton yield, 200 pounds lint cotton per acre; corn yield, 20 bushels per acre.]

System.	Crop areas.	Total land in crops.	Second or double crops.	Total of crops.
System 1:	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Cotton	22	33	0	33
Corn	11			
System 2:				
Cotton	18			
Corn	18	40	4	44
Oats or wheat followed by cowpeas	4			
System 3:				
Cotton and winter cover crop	16			
Cowpeas planted in May	8			
Oats or wheat followed by cowpeas	8	41	8	49
Corn	8			
Late Irish potatoes	1			
System 4:				
Cotton	13			
Corn	13	40	13	53
Oats or wheat followed by cowpeas	13			
Late Irish potatoes	1			
System 5:				
Cotton and winter cover crop	12			
Cowpeas planted in May	12			
Oats or wheat followed by cowpeas	12	50	12	62
Corn	12			
Sweet potatoes	1			
Late Irish potatoes	1			

Crop systems for medium soils, or those tilled with moderate effort; two men and two work animals—Continued.

System.	Crop areas.	Total land in crops.	Second or double crops.	Total of crops.
System 6:	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Cotton and winter cover crop	14	56	14	70
Cowpeas planted in May	14			
Oats or wheat followed by lespedeza	14			
Corn	14			
System 7:				
Cotton	14	46	8	54
Corn	10			
Oats or wheat followed by cowpeas	8			
Peanuts	4			
Cowpeas planted in May	8			
Sweet potatoes	1			
Late Irish potatoes	1			
System 8:				
Cotton and winter cover crop	10	51	11	62
Cowpeas planted in May	10			
Wheat or oats followed by cowpeas	10			
Soy beans	10			
Corn	10			
Early Irish potatoes followed by late Irish potatoes	1			
System 9:				
Corn and winter cover crop	20	82	22	104
Cowpeas planted in May	20			
Oats or wheat followed by lespedeza for hay, seed, or both	20			
Volunteer lespedeza for hay	20			
Early Irish potatoes followed by late Irish potatoes	2			
System 10:				
Cotton	12	49	7	56
Corn	12			
Sorghum hay	6			
Cowpeas planted in May	6			
Wheat or oats followed by cowpeas	6			
Alfalfa	6			
Early Irish potatoes followed by late Irish potatoes	1			

FOR EASTERN ARKANSAS.

Crop systems for silt and clay soils that are difficult to till; two men and two work animals.

[Cotton yield, 300 pounds lint cotton per acre; corn yield, 25 bushels per acre.]

System.	Crop areas.	Total land in crops.	Second or double crops.	Total of crops.
System 1:	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Cotton	18	27	0	27
Corn	9			
System 2:				
Cotton	15	34	4	38
Corn	15			
Wheat or oats followed by cowpeas	4			

Crop systems for medium soils, or those tilled with moderate effort; two men and two work animals—Continued.

System.	Crop areas.	Total land in crops.	Second or double crops.	Total of crops.
System 3:	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Cotton and winter cover crop	14			
Cowpeas planted in May	7			
Wheat or oats followed by cowpeas	7	36	7	43
Corn	7			
Late Irish potatoes	1			
System 4:				
Cotton	11			
Corn	11			
Wheat or oats followed by cowpeas	11	34	11	45
Late Irish potatoes	1			
System 5:				
Cotton and winter cover crop	10			
Cowpeas planted in May	10			
Wheat or oats followed by cowpeas	10			
Corn	10	42	10	52
Late Irish potatoes	1			
Sweet potatoes	1			
System 6:				
Cotton and winter cover crop	12			
Cowpeas planted in May	12			
Wheat or oats followed by lespedeza	12	48	12	60
Corn	12			
System 7:				
Cotton	12			
Corn	8			
Wheat or oats followed by cowpeas	6			
Peanuts	3	37	6	43
Cowpeas planted in May	6			
Sweet potatoes	1			
Late Irish potatoes	1			
System 8:				
Cotton and winter cover crop	9			
Cowpeas planted in May	9			
Wheat or oats followed by cowpeas	9			
Soy beans	9	46	10	56
Corn	9			
Early Irish potatoes followed by late Irish potatoes	1			
System 9:				
Corn and winter cover crop	18			
Cowpeas planted in May	18			
Wheat or oats followed by lespedeza for hay, seed, or both	18	74	20	94
Volunteer lespedeza for hay	18			
Early Irish potatoes followed by late Irish potatoes	2			
System 10:				
Cotton	9			
Corn	9			
Sorghum hay	6			
Cowpeas planted in May	6	43	7	50
Wheat or oats followed by cowpeas	6			
Alfalfa	6			
Early Irish potatoes followed by late Irish potatoes	1			

THINGS TO CONSIDER IN CHOOSING AND ADAPTING A CROP SYSTEM.

SOIL.

In applying the systems just described the farmer should bear in mind the fact that they have been calculated for three types of soil—light, medium, and heavy—and in adopting a system he should adapt it to his own type of soil.

YIELDS.

Yields also have an important bearing on the acreage that can be covered by a man and team. In adopting a system allowance should be made for yields that have been taken as a basis in calculating these systems, since, if yields were much larger than those assumed, that fact would necessitate hiring extra labor or cutting down the number of acres of crops farmed. For soils that are easy to till in southwestern Arkansas the assumed yields are 225 pounds of lint cotton per acre and 20 bushels of corn per acre, with other crops in proportion. For soils tilled with medium effort in central Arkansas the yields (actual averages on which these systems are based) are 200 pounds of lint cotton per acre and 20 bushels of corn per acre. For silt and clay soils in eastern Arkansas the assumed yields are 300 pounds of lint cotton per acre and 25 bushels of corn per acre.

An average day's work in picking cotton may be called 130 to 150 pounds of seed cotton; hence, if the yield is larger or smaller than the one assumed, it will be easy to calculate how much to allow for this circumstance.

TIME AVAILABLE FOR CROP WORK.

The number of days which men and teams can work in the field at crop work depends on the month and on the rainfall, but for average Arkansas conditions the time available is about as follows:

	Days.		Days.
February	10	July	20
February	10	August	20
March	15	September	20
April	18	October	20
May	20	November	15
June	20	December	12

This makes a total of 200 days in a year, and leaves 165 days not available for such work, of which 52 days are Sundays and 113 are days that are too wet, cold, or hot, although men and teams may work much of this time on improvements, repairs, cutting and hauling wood, and other miscellaneous work. On sandy soils the available time is greater than on other soils, because they dry more quickly after rains.

EFFECT OF WEATHER.

With soils of the same kind and with the same drainage there is a difference in the acres that can be handled per man and team ac-

cording to the amount and frequency of the rainfall. Many and frequent showers in the growing season mean fewer days available for field work and more weeds. The total rainfall in the State is greatest in eastern Arkansas, but the summer rainfall, which has an important bearing on this question, is fully as great in western Arkansas. There is no rule by which to estimate how much the acreages should be cut down in accordance with increase in summer rainfall, but the allowance to be made for this is probably not great.

There is no way of figuring accurately for extraordinary seasons, yet the farmer must figure and does figure whenever he decides on the number of acres of crops he will plant, and in a majority of cases he figures about right. During exceptionally wet Mays and Junes he gets caught in the grass, and something of the same kind must happen occasionally under any system. However, such exceptional seasons will not, in the long run, have more serious consequences with the systems here described than with those now followed.

TOPOGRAPHY AND STUMPS.

The acreage given for each system is for land that is level or gently sloping, and would have to be cut down for regions that are very hilly. It is also assumed that the land is practically free from stumps and sprouts.

SIZE OF FIELDS.

The size of the field, determining whether rows are long or short, has an effect on the number of acres that can be farmed per man and horse. The information on which all these cropping systems are based was gathered in regions where the fields are small to medium size, hence for large fields and long rows both men and teams could do somewhat better.

WEED MANAGEMENT.

Weeds are so common on every farm that they are generally accepted as necessary evils, and there is little appreciation of the far-reaching effect they have in reducing the area that can be farmed per man and team. The cost of weeds in a cotton field is much more than the cost of hoeing or than the loss entailed by the retarding of growth of cotton. They limit the area that can be farmed per man and mule, and in thus restricting they limit the size of the business and the income also.

The amount of labor with the hoe for May and June is somewhat more than half of all work on cotton during those months, and teams are busy only half to two-thirds of the time when men are busy all the time. At least this is the case where the number of hands is about equal to the number of work animals. Women and children, of course, are drafted into service during these months, but the point to be made clear is that any practices, implements, or kinds of management that can be put into effect to reduce the work with the hoe will enable the family to increase its crop acres and thus increase its

income. With good weed management there would be no need of women in the fields at this time.

In planning these cropping systems the work of chopping and hoeing was assumed to be the average under present practices; hence if the hoeing were reduced by any method whatever it would reduce the work for May and June, and thus permit the farmers to handle larger acreages or to handle one or two acres of Irish or sweet potatoes in addition to the regular crops.

It is well known that share croppers have a preference for growing cotton after cotton instead of after corn, because less hoeing is required, since less crab grass goes to seed in cotton than in corn fields. Crab grass is a serious nuisance in the cotton field, largely because it goes to seed freely in corn fields in previous years. The fact that corn is "laid by" much earlier than cotton accounts for this.

METHODS OF REDUCING HOEING.

A modern practice which helps to reduce the hoe work is to run a section harrow across the cotton rows before the crop is thinned. This may not be practicable if there is too much trash on the surface, but if the old cotton and corn stalks are well cut and are turned under deep there will be little trouble with trash on the surface. One of the advantages of planting cotton after cowpeas, soy beans, peanuts, or lespedeza is the fact that no trash is in the way and the young cotton can be cross-harrowed to the best advantage.

Another method by which some farmers reduce hoeing is to graze geese in the cotton fields. Whether the practice is advantageous from all standpoints or not, it is a fact that farmers who keep geese farm more acres of crops per hand than those who do not keep them. On 50 farms in Columbia County, Ark., the 30 farmers who kept geese raised 4 acres more crops per hand than those who did not keep them, and this was done in the face of the fact that 57 per cent of the cropped area was planted in cotton on the farms that kept geese as compared with 50 per cent on those that did not. Farmers estimate that 12 geese are equal to one hoe hand in keeping grass out of cotton. A danger connected with this practice, however, is that there is a tendency to depend too much on the geese and not keep the cotton as clean as it should be. It would seem that this was actually the case in Columbia County, where the 20 farmers who did not keep geese made 25 pounds more lint cotton per acre than those who kept them.

The old adage that an ounce of prevention is worth a pound of cure as applied in the matter of weed management is more effective than all the methods previously mentioned. Every well-kept nursery in the country is a standing demonstration of the effectiveness of preventing weeds from going to seed. Nurseries of young fruit trees usually stand three years, during which time no weeds are allowed to go to seed, and it is found that the first farm crop after nursery trees

is exceptionally clean. How to do this in ordinary farm practice is a question, but in system 5, for instance, it would be comparatively easy to prevent grass and weeds from going to seed by the following practices:

1. Keep corn clean and do not "lay by" too early.
2. Cut and shock corn as soon as ripe enough and disk the land immediately to destroy weeds. Then plant a winter cover crop on this land in September.
3. Give lambs, and sometimes sheep, the run of the cornfields in July and after.

During the first year of the rotation in system 5, when cotton occupies the land, it should be kept very clean, and a winter cover crop should be sown in the cotton "middles" in September.

During the second year of the rotation no troublesome weeds will ordinarily go to seed, because the land is broken in April and May and planted to cowpeas, which are harvested in August, after which the land is prepared for fall grains.

During the third year, when small grains followed by cowpeas occupy the land, it will be easy to manage so that few or no weeds will go to seed.

During the fourth year the corn, if handled as suggested, will leave the land practically free from weeds for the cotton of the following year.

PEAS OR NO PEAS BETWEEN CORN ROW?

The objection may be made that the plan of cutting and shocking corn and of disking the land immediately thereafter will prevent planting peas or other legume between the corn rows, because if the corn stubble were disked in late August or early September the legume would scarcely have made enough growth to warrant the expense for the seed. This objection would be valid if it were not that an abundance of legumes may be grown in Arkansas without planting cowpeas between the corn rows. The advantage of cutting and shocking corn and immediately disking the land is that much rough feed is thereby saved, a winter cover crop may be planted in season, and weeds and grasses are prevented from going to seed, all of which advantages are probably worth more than the interplanted cowpeas would be.

However, where corn rows are 6 to 7 feet apart a single row of cowpeas may be planted in each middle in June, and two more cultivations given, and if velvet beans are planted in the rows with the corn, then by the time the cowpeas are laid by the beans will quickly spread out and cover up and smother out young grass and weeds. This practice will prove satisfactory if the work is well done and at the right time, but in reality it will usually mean the growth of crab grass and the reseeding of this pestiferous annual.

SHEEP DESTROY WEEDS.

Sheep are extremely valuable as weed destroyers, and they can be shifted from field to field as crops permit, where they will clear up the fence rows. In some parts of the country it is common practice to turn the lambs, at weaning time, into the cornfields, where they destroy weeds, but do not injure the corn. Where the corn ears stand up fairly high sheep may be turned in after corn is laid by. They may eat an occasional ear that is down and they will trim up the lower blades of the corn, but they will not "ride" the stalks down as hogs do. The benefit which they thus render is much greater than the damage they do.

Temporary fencing made of poultry netting is convenient for confining sheep to specified areas, especially when this area is in corn, since the cornstalks serve very well as posts to which to tie the wire netting. Corner posts should, of course, be more substantial.

Sheep may be used also to destroy weeds in fields that are not planted in crops, along roadways, and in waste places, thus tending to clean up the whole place and reduce the weed seeds that may be blown in or tracked in on cultivated fields. Sheep are more convenient than goats for this purpose, since they are more easily confined.

EFFICIENCY OF MEN, TEAMS, AND IMPLEMENTS.

Some men and teams work faster and more regularly than others, and these differences make a great difference in the area they can cover. The acreages given for each of the foregoing systems are for the average workers and work animals, hence if men and teams are above or below the average in their ability to work, the acreages should be modified in each instance to suit the case. Also, it makes a difference whether one-horse or two-horse implements are used. The use of one-horse implements requires nearly double the man work and but a fraction less of horse work than the use of two-horse implements.

RELATION OF SYSTEMS TO FOOD PRODUCTION.

Present conditions require that yields be increased, that foodstuffs be raised in abundance, and that the supply of fats and proteins, vegetable and animal, be increased.

The various crop systems above described meet these requirements in somewhat different measure. Some are well calculated to increase soil fertility and the yield of crops, and some are not. Some are high in food production and some are low. Some are well adapted to the production of meat, milk, etc., and others are not. It may be taken for granted that in most cases the farm should raise all the feedstuffs that are consumed on the farm, unless possibly some concentrates are bought to balance the corn, hay, and roughage grown, and it may also be assumed that each farm should produce an abundance of

vegetables, fruits, milk, meat, butter, poultry, eggs, sweet corn, and peas for the use of the family. It is, of course, assumed that certain vegetables and fruits will be grown in the home garden, a most important supplement to any crop system that may be adopted; also that improved pastures will be provided. Even with these additional sources of food supply, however, system 1 would be lacking in the matter of furnishing home supplies, whereas system 5 would furnish all these things in large measure. Indeed, the latter system would not only furnish enough food and feed for the family, but would furnish a surplus for market.

Some kind of live stock, of course, should be kept to consume the surplus feed which some of these systems supply. In system 5, for instance, if the oats were fed to the team, all the corn and part of the peas could be used to produce pork. A few cows could also be kept to consume cowpea hay, and some dairy products could be sold. Such a system would produce all the cotton that an average family could pick, food and feedstuffs for home use, and other crops or animals and animal products to be marketed, and would thus constitute a well-rounded system of farming.

RELATION OF SYSTEMS TO LABOR REQUIREMENTS.

It is a matter of great importance that men and teams be kept reasonably busy at profitable work, and if we consider the various systems from this standpoint we find that some are better than others. Cotton requires little team work after the 1st of August, but a great deal of man, woman, and child work, and thus system 1, in which two-thirds of the land is occupied with cotton, is markedly inefficient in its use of horses and mules. Some of these systems distribute the work of men and teams over the year very evenly, but in others, as, for instance, in systems 1 and 2, the seasonal distribution of labor is poor. August is entirely unoccupied under several systems, but is partly used or occupied in systems 5 and 6.

More acres are farmed per man and mule under some systems than under others, yet the systems in which most acres are farmed are those which stand high from the standpoint of increasing fertility. Under system 3 a farmer can farm 25 per cent more land than under system 1 and keep it in a higher state of fertility. Also, under system 5 two men and a team can easily farm 50 acres, as compared with 40 acres under system 2, make the land richer at the same time, and probably increase the average production of cotton per family.

High production per acre, high production per man, plenty of food for home use, and a high efficiency of man and mule labor are to be attained through following, not necessarily precisely, the systems here outlined, but at least the principles upon which the approved systems presented have been based.

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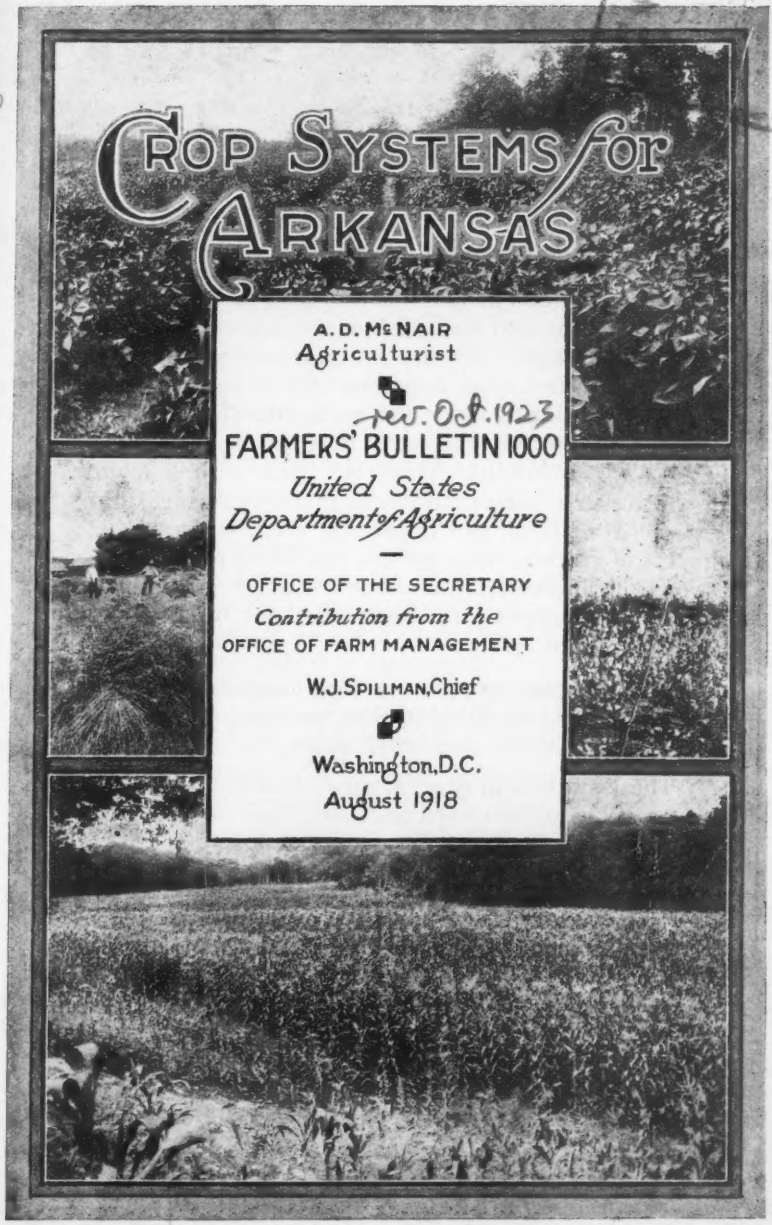

Crop Systems for Arkansas

A. D. McNAIR
Agriculturist

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Contribution from the
OFFICE OF FARM MANAGEMENT

W. J. SPILLMAN, Chief

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August 1918

CROP SYSTEMS for Arkansas that make for increased food production and increased efficiency in man labor and horse labor are described in the following pages. By the introduction of cowpeas, soy beans, and other legumes, and by second cropping, provision is made for a considerable increase in the number of crop acres that can be farmed by the average family. Thus, two men with a team, who under a cotton and corn system can farm but 33 acres of land, can handle 50 acres and raise 62 acres of crops under a system providing for a 4-year rotation, including (1) cotton with a winter cover crop, (2) cowpeas, (3) oats or wheat followed by cowpeas, and (4) corn.

In each of the cropping systems suggested the crop acreages are calculated for two men and a team, and for light, medium, and heavy soils.

These systems in general apply to all of Arkansas, except the northwestern part, and some of them may be used to advantage in northern Louisiana, northeastern Texas, southeastern Oklahoma, western Tennessee, and the northern half of Mississippi.

Revised October, 1923

CROP SYSTEMS FOR ARKANSAS.

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NEED OF BETTER SYSTEMS.

EVERY FARMER decides before each planting season what crops he will plant and the approximate acreage of each, and he bases his estimate of acreage on his previous experience or the experience of some one whose judgment he trusts. But the moment that he attempts to introduce a new crop, and often when he changes the acreages of his old ones, he is at a loss to determine how much he can handle with his labor, teams, and equipment. Many a farmer has lost money by miscalculation in this regard.

At present there is more than the usual changing of plans among Arkansas farmers, and there is a real need for definite information as to how many acres of crops a family and a team should be expected to farm and how the number of acres varies according to the crop system adopted. It is pretty well known in each community how many acres of the standard crops can be farmed per family or per mule, but there is little or no knowledge as to how many acres might be farmed under other systems, and this bulletin is written to give some definite information on this point.

A study of 70 farms in the northern end of Pulaski County, Ark., covering the year 1916, showed that families farmed an average of 33.7 acres of all crops. On 50 farms in Lee and Phillips Counties in eastern Arkansas, they farmed 27.8 acres, while around Magnolia, in southwestern Arkansas, they farmed 36.7 acres. These variations were due partly to the type of farming, partly to differences in crop yields, partly to differences in the type of soil, and partly to other factors.

Families differ, of course, in size, but the average number of hands per family on the farms included in this inquiry was about 2, or one man and a boy, and the average number of work animals per family

also about 2 (with considerable variation, however, in different sections). These averages have been made the basis of this bulletin. The crop systems mentioned have been calculated from labor data gathered from many farms, and the acreages given are such as two men and a team can farm handily, with some exceptions to be noted. These acreages are based on the experience of farmers at Jacksonville, Pulaski County, where average yields are 200 pounds of lint cotton and 20 bushels of corn per acre, and where the soil is neither as easy to till as in the very sandy regions nor as hard as in the silty, clayey soils which abound in the State. In using these figures allowance must be made for variations in type of soil, yield, and other things. (On pages 15 to 18 the acres for each system are given for medium soils in central Arkansas, for silty soils in eastern Arkansas, and for sandy soils in southwestern Arkansas, with yields of cotton and corn for each locality.)

HOW THE SYSTEMS MAY BE ADAPTED TO INDIVIDUAL NEEDS.

The systems here described are believed to be numerous and varied enough to satisfy usual variations in conditions; if one does not fit, another may. In many cases they will be merely suggestive; if the farmer sees one that he thinks is good he may adopt it, or he may modify it to suit his case. There are numberless possible combinations of crops and acreages, but the 10 which are given will probably suffice to illustrate the principles of combination and give ample opportunity for choice.

What may be done with two work animals is fairly indicative of what may be done with any other number of work animals. Thus, other things being equal, the farmer with but one mule can count on covering approximately half the acreage covered by the farmer with a team, while the farmer who is in position to keep three teams at work can count on covering approximately three times that acreage.

In using the figures given in this bulletin for estimating the acreage that may be farmed with a given crew, the number of men available should be taken into account as well as the number of horses or mules. If the number of "hands" varies in marked degree from the number of work animals, some allowance must be made for that fact. Where hands are more numerous than work animals, there is a marked tendency toward a very liberal use of the hoe, and if they are fewer in number the work animals stand idle part of chopping time unless extra hands are hired. Indeed, the average work animal on the farms studied in Arkansas does not work up to the limit of available time even in the busy months of May and June, which means, in part, that the farmer stops the plow part of the time to help out with the hoe, a fact which has greater significance than is apparent on the surface. If a farmer has two work animals, but fewer than two

field hands, or their equivalent in boys or women who do field work, he can not farm the acreages suggested unless he can hire some extra labor. In actual practice each farmer must modify the system adopted so that the crop acres will be in proportion to the labor.

Total farm acreages are not given, since the systems are all figured on the basis of acres of crop land two men and two work animals may be expected to farm. Size of farm would vary according to the percentage of improved land and according to the amount of stock kept and the need for pasture. Under all systems pastures would be needed and these must be large enough to graze the stock that are on the farm. Only actual crop acreages are given here, leaving it to each person to estimate how much more land will be needed for pasture, etc.

In the following systems it is assumed that the soil is one which can be worked with medium ease and that the yields are 200 pounds of lint cotton or 20 bushels of corn per acre. With soils that are hard to till, or when yields are larger, the acreage that two men and a team can handle will be proportionately smaller.

TEN SYSTEMS OUTLINED.

System 1. A COMMON SYSTEM, TWO-THIRDS COTTON AND ONE-THIRD CORN.

The first system to be mentioned, though this does not imply that it is the best, is one in which cotton occupies two-thirds of the cropped area and corn one-third. The acreages of these crops which two men and a team can conveniently farm on Jacksonville soils, with an average yield of 200 pounds of lint cotton and 20 bushels of corn per acre, are as follows:

	Acres.
Cotton	22
Corn [1]	11

This system, with the yields mentioned, would give two hands profitable work 120 to 130 days a year and would keep the team busy 70 to 75 days. During the months of May and June both men would be busy about all the time the average weather would permit, and they would doubtless fall behind their schedule if those months were rainy. Under average conditions, however, the two work animals would be busy less than two-thirds of the available time during these two months. The work of cotton picking could be handled by two average hands, even though they did not get to it as fast as it was ready. They could pick it out by the 20th of November in this latitude, with an ordinary season.

One unfavorable feature of this system is that it provides no hay, though some of the farmers still "pull" fodder and thus get "hay" of a good quality, though at a high cost.

[1] Early-planted corn is assumed in all these systems.

COWPEAS IN THE CORN.

The practice of planting cowpeas between the corn rows is so common that it should be mentioned in this connection. In calculating the various systems the work of picking peas-in-corn was not included. Often they are hogged down and sometimes cornstalks and peas are harvested together for hay. If they are gathered, however, extra labor will be needed, which can be figured on the basis of one day's work for a bushel of peas, or thereabouts. Where there are a number of children in the family both cotton and peas could probably be picked without hiring extra labor, but since the labor of picking peas is so great and since it conflicts with cotton picking, it would seem better for communities to save their peas by machine methods from peas planted alone. If peas are planted between the corn rows it would seem advisable, from the labor standpoint, to graze them off, unless plenty of labor is available. If it is desired to pick them, and if extra labor (in excess of two hands) is not available, the acreage of crops would have to be cut down from the figures given, hence the gain from legume seed saved would be counterbalanced by a decrease in the size of the farm business. If velvet beans are planted instead of cowpeas the beans may be picked without extra labor, because the work can be done after cotton picking is finished.

System 2. A BETTER SYSTEM, HALF COTTON AND HALF CORN.

A crop system which runs less strongly to cotton and which has been practiced by some of the best Arkansas planters, is one in which half of the land is devoted to cotton and half to corn, though in practice a few acres of other crops are grown. The acreages of crops which can be farmed by two men and a team with this system on medium soils are as follows:

	Acres.
Cotton	18
Corn	18
Wheat or oats, followed by cowpeas	4

By cutting down the cotton acreage 4 acres per team as compared with system 1, the corn acreage can be increased by about 7 acres and still leave time to handle about 4 acres of wheat or oats followed by cowpeas. Since early corn is laid by in June, there is time to care for a few acres of oats and cowpeas without conflict with other crops. While there is 4 acres less cotton in system 2 than in system 1, yet there are 44 acres of all crops, counting the peas following oats, compared with 33 acres in system 1. If cowpeas are interplanted in the corn, they can not be picked unless there are more than two hands, but they can be fed off.

It is very likely that the yield of cotton per acre would be greater under system 2 than under system 1.

This system would give two men profitable work 120 to 130 days a year, and a team 85 to 90 days.

System 3. MORE COWPEAS.

There are many Arkansas farmers who believe that system 2 does not go far enough toward diversification, but who nevertheless desire the cotton acreage to exceed that of any other single crop. Such farmers will find the following system a convenient one to follow:

	Acres.
Cotton and winter cover crop	16
Cowpeas planted in May	8
Oats or wheat followed by cowpeas	8
Corn	8
Late Irish potatoes	1

This totals 49 acres of crops on 41 acres of land.

These crops may be arranged in a five-year rotation in which cotton occupies one division of the land for two years, cowpeas one year, oats and cowpeas one year, and corn one year. A winter cover crop should follow the cotton crop, at least that part which precedes cowpeas, because of the considerable growth it would attain in the spring before being plowed under. Under this system work is somewhat crowded in September and October, but some of the cotton could be picked by extra hands.

In this arrangement nearly 40 per cent of the cropped area is devoted to cotton, which is a little less than in system 2.

These crops would give two men profitable work 125 to 135 days a year, and a team 95 to 100 days.

System 4. THE "THREE-YEAR" ROTATION.

Many excellent authorities for years have recommended for Arkansas what is called the "three-year" system of crop rotation, which means that one-third of the cropped area shall be in cotton, one-third in corn, and one-third in oats, followed by cowpeas. The acreage which two men and a team can handle under this system depends somewhat on the order in which crops follow each other. In some cases oats are drilled between the cotton rows, which makes corn follow after oats and cowpeas and precede cotton. In some cases spring oats are planted where cotton grew the year before, in which case the sequence of crops is the same. In still another case the oats follow corn, the cowpeas follow oats the same year, and cotton follows the cowpeas the year after. Planting oats between cotton rows is more practical in the hills than on the bottom lands. Planting in the fall after corn usually means late and inadequate preparation, with much danger of winter killing; but if corn is cut and shocked or put in silos in late August or early September instead of being snapped from the standing stalk, there is ample time to prepare a good seed bed for oats or other fall grain. People who

have never cut and shocked corn seem afraid of damage by the weather, but for the latitude of Arkansas it has been proved many times that the practice is a safe one. If one cuts at the right time and shocks well he may be sure of good results.

Assuming, then, that winter oats follow corn; that the corn is cut and shocked; that cowpeas follow oats the same year; and that cotton follows cowpeas, the acreages that two men and a team can farm will be as follows:

	Acres.
Cotton	13
Corn	13
Wheat or oats, followed by cowpeas	13
Late Irish potatoes	1

This makes a total of 53 acres of crops on 40 acres of land, the cowpeas being a second crop on the oat land.

This system, which has been highly recommended by agricultural authorities, leaves something to be desired from the labor standpoint. It requires too much labor in the month of June; but from other standpoints it is an excellent system.

In this instance an acre of late Irish potatoes has been added to the usual three-crop rotation, late potatoes being chosen because the early crop involves much work in June, the busiest month under this system.

Whether the cowpeas in this system shall be cut for hay, thrashed for seed, hogged down, or harvested partly by one method and partly by another is a question that must be answered according to circumstances. Also it may be debatable whether they should be planted in rows and cultivated or sown broadcast. In calculating the labor for this system it was assumed that the peas were sown broadcast and harvested for hay.

If it is desired to save peas for seed they should be planted in rows, cultivated, cut with a mowing machine, and thrashed with a machine which thrashes them from the entire plant. Such machines are not as common as they ought to be, and there are communities where this plan is not practicable; but if farmers would plant peas in this manner and in the quantity suggested, thrashing machines would soon be provided to handle the business.

This system would give two men profitable work 120 to 130 days a year and a team 95 to 100 days.

System 5. A FOUR-YEAR ROTATION.

The weakness of system 4 is that it requires too much labor in June. This can be remedied by adding another year to the rotation and having a crop of cowpeas that is planted in May and harvested in August. With this modification of system 4, we have the four-year rotation (illustrated on the title page):

	Acres.
Cotton	12
Corn and winter cover crop	12
Cowpeas, planted in May	12
Oats or wheat, followed by cowpeas	12
Sweet potatoes	1
Late Irish potatoes	1

Under this system two men and a team can farm 62 acres of crops on 50 acres of land and be no busier than with system 4. There is only 1 acre less cotton than in system 4, but there are 9 acres more of total crops, a result accomplished by arranging the crops so that the work is well distributed over the year.

FIG. 1.—Left: Rye grown after corn; no fertilizer, no clover. Right: Rye on same land, same stage of growth, seeded after late Irish potatoes that had been fertilized with a crop of crimson clover plowed under and 300 pounds of commercial fertilizer per acre.

A feature of this system which has a bearing on the maintenance or increase of soil fertility is worth considering. The land for the May-planted cowpeas will be broken late (in April and May), hence a winter cover crop preceding the cowpeas would have ample time to make considerable growth before being plowed under. What that winter cover crop should be may be left to circumstances to decide, but crimson clover, bur clover, or the winter grains are suitable for the purpose. (See fig. 1.)

In this system there is no doubt what place oats or other small grain should occupy in the crop sequence, for nothing could be easier or better than to have them follow cowpeas, which are harvested in August. The main rotation would then be as follows:

First year: Cotton followed by a winter cover crop.
Second year: Cowpeas, planted in May, and harvested in August.
Third year: Oats or wheat. Followed by cowpeas.
Fourth year: Corn. (The corn may have cowpeas, soy beans, or velvet beans interplanted, which will furnish feed and serve as a fertilizer for the next year's cotton.)

Under this system there will be an abundance of feed, the surplus of which may be fed or sold as circumstances dictate. If oats is the small grain, it will furnish all the grain needed for the team and some for sale. The corn, with cowpeas or velvet beans or soy beans between, can all be transformed into pork if that seems the best method of disposal. The cowpeas that follow oats or wheat may be hogged down or saved for seed, while the cowpeas that ripen in August will furnish all the hay needed and perhaps some early feed for hogs. The sweet potatoes and late Irish potatoes will furnish abundance of food for the family and some for sale.

Considering the winter cover crop and the large area of cowpeas in this rotation, 12 acres of cotton probably will produce as many bales as the 13 acres in system 4 and nearly or quite as many as the 18 acres in system 2. The lower acreage of cotton will be compensated for by higher yields of cotton and by increased acreages of other crops.

Under this system two men will be busy at profitable work 120 to 130 days a year, and the team 100 to 105 days, not including baling hay and marketing feed crops.

System 6. INCLUDING LESPEDEZA.

System 6 is substantially the same as system 5, except that lespedeza (Japan clover) takes the place of the cowpeas that follow oats or wheat. Also the Irish and sweet potatoes are left out, at least so far as market crops are concerned. The acreages which two men and a team can farm under this system will be as follows:

	Acres.
Cotton and winter cover crop	14
Cowpeas planted in May	14
Oats or wheat followed by lespedeza	14
Corn	14

This makes a total of 70 acres of crops on 56 acres, the lespedeza being a second crop after oats or wheat.

This system is not as generally applicable as system 5, because there are many poor upland soils where lespedeza does not grow

tall enough for a hay crop. It is applicable, however, to creek and river bottom lands, at least so far as lespedeza is concerned, and to the silty soils of eastern Arkansas. Moisture is the important thing in making a crop of lespedeza and if that is plentiful it can be grown for hay even on the poorer lands.

By substituting lespedeza for cowpeas, following oats or wheat, it is possible to farm a larger area with the same crew and equipment, because of the fact that lespedeza requires no work in June, whereas cowpeas following oats or wheat must be planted on freshly broken land—land that must be broken in June and early July. The net effect of this change on the acres that can be farmed by two men and a team is that they can handle 70 acres of crops raised on 56 acres of land compared with 62 acres of crops on 50 acres of land in system 5.

Lespedeza seed has been so expensive for several years that it is possible that to save the seed alone and let the rest of the crop go to the land as a fertilizer might pay very well.

In this system, as in system 5, there would be more than enough oats for the team, hence the corn with peas or other legume could be made into pork. Lespedeza could be marketed as hay or seed or fed to cattle. The cowpeas planted in May could be made into hay, or part of them could furnish early feed for hogs.

Such systems as this, as well as systems 3, 4, and 5, would involve the use of grain binders and thrashing machines. Farming conditions would be better if such machines were more numerous in many parts of the cotton region, and such crop systems would tend to increase their numbers.

Under this system two men would be busy at profitable work 120 to 130 days a year, and the team 105 to 110 days a year, not including the work of baling hay and marketing feed crops.

System 7. A MIXED SYSTEM.

System 7 may be called a mixed system, with a considerable variety of crops, though cotton leads, occupying about 30 per cent of the cropped area. Under average conditions two men and a team can farm, under this system, the following acreages of various crops:

	Acres.
Cotton	14
Corn	10
Oats or wheat followed by cowpeas	8
Cowpeas planted in May	8
Peanuts	4
Sweet potatoes	1
Late Irish potatoes	1

This makes a total of 54 acres of crops on 46 acres of land. This system is irregular in its acreages of crops, yet it can easily be

arranged into a three-year rotation with an odd acre outside the rotation.

May and June are busy months under this system, as are September and October. The May and June work can be handled by two hands, however, provided the hoeing is not excessive, and it will not be excessive if proper implements are used and the weed management is good.

The October work is fairly heavy, but it can be managed by hiring extra labor for a few days or by throwing some of the October work into November, such as gathering corn or picking cotton. Corn is ordinarily gathered in October, but it may be cut and shocked in August, and may then stand till November before it is husked, a plan that reduces the October work and permits early preparation for fall grains.

This system, like several of the preceding, provides feed for the stock and food for the family, and some surplus for sale. Corn, peas, peanuts, and sweet potatoes are preeminently desirable as hog feed, and any surplus of these things can be utilized in making pork.

These crops will keep two men busy at profitable work 130 to 140 days a year, and a team 100 to 105 days, not including the work of baling hay and marketing feed crops.

System 8. SOY BEANS ADDED.

The soy bean crop is one of the promising new crops for North and South and one particularly desirable on account of its high content of oil and protein, or fat and muscle making food. It is already a considerable crop in eastern North Carolina, where machines are used for harvesting the crop for seed. The crop grows well in all the cotton States, but in most localities the methods of saving seed are still crude. System 8 includes soy beans as one of the important crops, and under this system two men and a team may be expected to handle crops as follows:

	Acres.
Cotton and winter cover crop	10
Cowpeas planted in May	10
Wheat or oats, followed by cowpeas	10
Soy beans	10
Corn	10
Early Irish potatoes	1
Late Irish potatoes	1

This makes 62 acres of crops on 51 acres of land, the wheat or oats being followed by cowpeas the same year, and the early Irish potatoes being followed by a late crop.

Two of these crops may be followed by winter cover crops without necessitating the hiring of extra labor, and these may be sown in September in both the cotton and the soy beans.

If a leguminous cover crop follows cotton, and if corn is interplanted with cowpeas or velvet beans, every acre of land except the 1 acre occupied by Irish potatoes will have a legume on it every year, which means a gain in soil fertility.

This system is well adapted to the production of live stock, especially hogs, though, of course, extra pasture will be needed in all these systems if many animals are kept. Soy beans may be turned into pork or saved for hay or seed. This system, as well as several that precede it, would produce as much cotton as the average family now raises and possibly more, would provide plenty of feed and food, and would furnish a variety of products for sale. Whether to sell the feed products direct or through animals is a question that must be answered differently under different conditions, but if there should be a general movement toward such systems as 3, 4, 5, 6, 7, and 8, some of the feeds must go into live stock to prevent glutting the feed market.

Under this system two men will be busy at profitable work 120 to 130 days, and the team 105 to 110 days, not including baling hay and marketing feed crops.

System 9. NO COTTON.

All the systems described hitherto have had cotton as the principal money crop, but in this system there is none. Cotton is a good money crop and most southern farmers should grow it, but there are a few men here and there who prefer not to grow it, and these may be interested in such a system. System 9 is less intensive than any of the others here suggested, being based almost entirely on grain and hay crops, which require a small amount of labor. It can not be recommended, however, outside of the lespedeza area. The acreages of crops for this system are as follows:

	Acres.
Corn and winter cover crop	20
Cowpeas planted in May	20
Oats or wheat followed by lespedeza for hay, seed, or both	20
Volunteer lespedeza for hay	20
Early Irish potatoes	2
Late Irish potatoes	2

This is a total of 104 acres of crops on 82 acres of land. Twenty acres of lespedeza is a second crop, and 2 acres of late Irish potatoes follow the early crop on the same land.

It would lighten the October work in this system and would facilitate the planting of a winter cover crop after corn if the latter crop were cut and shocked or part of it put into the silo; and a cover crop is particularly desirable because, being followed by cowpeas, it has time to make a heavy growth before being plowed under.

These crops would prove excellent for a dairy farmer using hogs as a side line, or would be good crops to market if care were taken

to get a good quality of grain and hay. However, if system 9 were adopted by dairymen the crop acres might have to be scaled down, since dairymen can not put in as many hours in the field as other farmers.

The Irish potatoes, though occupying a small area, would doubtless add considerably to the farm income, and the legumes would have a very beneficial effect on the fertility of the soil.

All of these crops would keep two men busy at profitable work 130 to 140 days a year, and a team about the same time, but this does not include baling hay and marketing hay and grain. If all these crops were marketed as such, the system would keep the men and the team busy much of the winter as well as all summer.

System 10. INTRODUCING HUBAM CLOVER.

The fact that Hubam clover produced larger gains on hogs than Dwarf Essex rape at the Arkansas Experiment Station in 1923, and that it made an excellent volunteer growth on land where a seed crop had been harvested the year before, suggests the possibility of using it in a crop system wherever the soil is inoculated for it and wherever the land has enough lime for it.

In the following crop system embracing Hubam clover as one of the crops, two men and a team could easily handle the following crops:

	Acres.
Corn	20
Hubam clover	20
Wheat or oats followed by lespedeza	20
Volunteer lespedeza	20

This makes 100 acres of crops on 80 acres of land and would keep a team busy about 120 days without baling hay or marketing crops, and it would be so easy for two men that they could milk a dozen cows and still do the farm work.

An excellent plan for utilizing these crops would be to sell the winter oats as a cash crop for seed and then feed the other crops to dairy cows, with hogs, perhaps, as a side line. There is need of a supply of oats for fall planting because the small farmer has need of them for hay and pasture, yet he has not the facilities for saving seed. The larger farmer could raise them profitably under the system described and could sell them to his neighbors at a price that would be attractive to them. If he overdid the seed business, he could sell oats for feed or feed them at home.

The growing of Hubam clover would have to be confined to those areas where red clover and alfalfa do well, but it fits into a rotation better than either of those crops because the date of its harvest is soon after early corn is laid by, hence there is no conflict of labor between these two crops.

SUMMARY OF THE SYSTEMS, WITH ACREAGES FOR LIGHT, MEDIUM, AND HEAVY SOILS.

The acreages specified in the foregoing descriptions of the various systems suggested are for central Arkansas, where the soil is moderately easy to till. The systems as outlined, however, apply to the greater part of the State, with such changes in acreages as are made necessary by differences in soil. In the northeast they would have to be modified somewhat, and in the northwest they do not apply at all. In eastern Arkansas the soils are heavy and the acreages that can be covered by a man and team are reduced accordingly, while in southwestern Arkansas the soils are very light and the acreages that can be covered are correspondingly larger. In the following summary of these crop systems the acreages are given for each of the three sections—for light, medium, and heavy soils.

Some of these systems will be found practicable in northern Louisiana, northeastern Texas, southeastern Oklahoma, western Tennessee, and the northern half of Mississippi.

FOR SOUTHWESTERN ARKANSAS.

Crop system for sandy soils easy to till; two men and two work animals.

[Cotton yield, 225 pounds lint cotton per acre; corn yield, 20 bushels per acre.]

System.	Crop areas.	Total land in crops.	Second or double crops.	Total of crops.
	Acres.	*Acres.*	*Acres.*	*Acres.*
System 1:				
Cotton	23			
Corn	12	36	.....	36
Early Irish potatoes	1			
System 2:				
Cotton	19			
Corn	19	43	5	48
Oats or wheat followed by cowpeas	5			
System 3:				
Cotton and winter cover crop	17			
Cowpeas planted in May	9			
Oats or wheat followed by cowpeas	9	45	9	54
Corn	9			
Late Irish potatoes	1			
System 4:				
Cotton	14			
Corn	14	43	14	57
Oats or wheat followed by cowpeas	14			
Late Irish potatoes	1			
System 5:				
Cotton and winter cover crop	13			
Cowpeas planted in May	13			
Oats or wheat followed by cowpeas	13	54	13	67
Corn	13			
Sweet potatoes	1			
Late Irish potatoes	1			
System 6:				
Cotton and winter cover crop	15			
Cowpeas planted in May	15			
Oats or wheat followed where feasible by lespedeza	15	60	15	75
Corn	15			
(It is doubtful whether lespedeza is suited to this region.)				

Crop system for sandy soils easy to till; two men and two work animals—Continued.

System.	Crop areas.	Total land in crops.	Second or double crops.	Total of crops.
System 7:	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Cotton	15			
Corn	11			
Oats or wheat followed by cowpeas	8			
Peanuts	4	50	8	58
Cowpeas planted in May	10			
Sweet potatoes	1			
Late Irish potatoes	1			
System 8:				
Cotton and winter cover crop	11			
Cowpeas planted in May	11			
Oats or wheat followed by cowpeas	11			
Soy beans	11	56	12	68
Corn	11			
Early Irish potatoes followed by late Irish potatoes	1			
System 9 (not applicable to this region).				
System 10 (not applicable to this region).				

FOR CENTRAL ARKANSAS.

Crop systems for medium soils, or those tilled with moderate effort; two men and two work animals.

[Cotton yield, 200 pounds lint cotton per acre; corn yield, 20 bushels per acre.]

System.	Crop areas.	Total land in crops.	Second or double crops.	Total of crops.
System 1:	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Cotton	22	33	0	33
Corn	11			
System 2:				
Cotton	18			
Corn	18	40	4	44
Oats or wheat followed by cowpeas	4			
System 3:				
Cotton and winter cover crop	16			
Cowpeas planted in May	8			
Oats or wheat followed by cowpeas	8	41	8	49
Corn	8			
Late Irish potatoes	1			
System 4:				
Cotton	13			
Corn	13	40	13	53
Oats or wheat followed by cowpeas	13			
Late Irish potatoes	1			
System 5:				
Cotton and winter cover crop	12			
Cowpeas planted in May	12			
Oats or wheat followed by cowpeas	12	50	12	62
Corn	12			
Sweet potatoes	1			
Late Irish potatoes	1			

Crop systems for medium soils, or those tilled with moderate effort; two men and two work animals—Continued.

System.	Crop areas.	Total land in crops.	Second or double crops.	Total of crops.
System 6:	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Cotton and winter cover crop	14			
Cowpeas planted in May	14	56	14	70
Oats or wheat followed by lespedeza	14			
Corn	14			
System 7:				
Cotton	14			
Corn	10			
Oats or wheat followed by cowpeas	8			
Peanuts	4	46	8	54
Cowpeas planted in May	8			
Sweet potatoes	1			
Late Irish potatoes	1			
System 8:				
Cotton and winter cover crop	10			
Cowpeas planted in May	10			
Wheat or oats followed by cowpeas	10			
Soy beans	10	51	11	62
Corn	10			
Early Irish potatoes followed by late Irish potatoes	1			
System 9:				
Corn and winter cover crop	20			
Cowpeas planted in May	20			
Oats or wheat followed by lespedeza for hay, seed, or both	20	82	22	104
Volunteer lespedeza for hay	20			
Early Irish potatoes followed by late Irish potatoes	2			
System 10:				
Corn	20			
Hubam clover	20	80	20	100
Wheat or oats followed by lespedeza	20			
Volunteer lespedeza	20			

FOR EASTERN ARKANSAS.

Crop systems for silt and clay soils that are difficult to till; two men and two work animals.

[Cotton yield, 300 pounds lint cotton per acre; corn yield, 25 bushels per acre.]

System.	Crop areas.	Total land in crops.	Second or double crops.	Total of crops.
System 1:	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Cotton	18	27	0	27
Corn	9			
System 2:				
Cotton	15			
Corn	15	34	4	38
Wheat or oats followed by cowpeas	4			

Crop systems for medium soils, or those tilled with moderate effort; two men and two work animals—Continued.

System.	Crop areas.	Total land in crops.	Second or double crops.	Total of crops.
System 3:	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Cotton and winter cover crop	14			
Cowpeas planted in May	7			
Wheat or oats followed by cowpeas	7	36	7	43
Corn	7			
Late Irish potatoes	1			
System 4:				
Cotton	11			
Corn	11	34	11	45
Wheat or oats followed by cowpeas	11			
Late Irish potatoes	1			
System 5:				
Cotton and winter cover crop	10			
Cowpeas planted in May	10			
Wheat or oats followed by cowpeas	10	42	10	52
Corn	10			
Late Irish potatoes	1			
Sweet potatoes	1			
System 6:				
Cotton and winter cover crop	12			
Cowpeas planted in May	12	48	12	60
Wheat or oats followed by lespedeza	12			
Corn	12			
System 7:				
Cotton	12			
Corn	8			
Wheat or oats followed by cowpeas	6			
Peanuts	3	37	6	43
Cowpeas planted in May	6			
Sweet potatoes	1			
Late Irish potatoes	1			
System 8:				
Cotton and winter cover crop	9			
Cowpeas planted in May	9			
Wheat or oats followed by cowpeas	9			
Soy beans	9	46	10	56
Corn	9			
Early Irish potatoes followed by late Irish potatoes	1			
System 9:				
Corn and winter cover crop	18			
Cowpeas planted in May	18			
Wheat or oats followed by lespedeza for hay, seed, or both	18	74	20	94
Volunteer lespedeza for hay	18			
Early Irish potatoes followed by late Irish potatoes	2			
System 10:				
Corn	18			
Hubam clover	18			
Wheat or oats followed by lespedeza	18	72	18	90
Volunteer lespedeza	18			

THINGS TO CONSIDER IN CHOOSING AND ADAPTING A CROP SYSTEM.

SOIL.

In applying the systems just described the farmer should bear in mind the fact that they have been calculated for three types of soil—light, medium, and heavy—and in adopting a system he should adapt it to his own type of soil.

YIELDS.

Yields also have an important bearing on the acreage that can be covered by a man and team. In adopting a system allowance should be made for yields that have been taken as a basis in calculating these systems, since, if yields were much larger than those assumed, that fact would necessitate hiring extra labor or cutting down the number of acres of crops farmed. For soils that are easy to till in southwestern Arkansas the assumed yields are 225 pounds of lint cotton per acre and 20 bushels of corn per acre, with other crops in proportion. For soils tilled with medium effort in central Arkansas the yields (actual averages on which these systems are based) are 200 pounds of lint cotton per acre and 20 bushels of corn per acre. For silt and clay soils in eastern Arkansas the assumed yields are 300 pounds of lint cotton per acre and 25 bushels of corn per acre.

An average day's work in picking cotton may be called 130 to 150 pounds of seed cotton; hence, if the yield is larger or smaller than the one assumed, it will be easy to calculate how much to allow for this circumstance.

TIME AVAILABLE FOR CROP WORK.

The number of days which men and teams can work in the field at crop work depends on the month and on the rainfall, but for average Arkansas conditions the time available is about as follows:

	Days.		Days.
February	10	July	20
February	10	August	20
March	15	September	20
April	18	October	20
May	20	November	15
June	20	December	12

This makes a total of 200 days in a year, and leaves 165 days not available for such work, of which 52 days are Sundays and 113 are days that are too wet, cold, or hot, although men and teams may work much of this time on improvements, repairs, cutting and hauling wood, and other miscellaneous work. On sandy soils the available time is greater than on other soils, because they dry more quickly after rains.

EFFECT OF WEATHER.

With soils of the same kind and with the same drainage there is a difference in the acres that can be handled per man and team ac-

cording to the amount and frequency of the rainfall. Many and frequent showers in the growing season mean fewer days available for field work and more weeds. The total rainfall in the State is greatest in eastern Arkansas, but the summer rainfall, which has an important bearing on this question, is fully as great in western Arkansas. There is no rule by which to estimate how much the acreages should be cut down in accordance with increase in summer rainfall, but the allowance to be made for this is probably not great.

There is no way of figuring accurately for extraordinary seasons, yet the farmer must figure and does figure whenever he decides on the number of acres of crops he will plant, and in a majority of cases he figures about right. During exceptionally wet Mays and Junes he gets caught in the grass, and something of the same kind must happen occasionally under any system. However, such exceptional seasons will not, in the long run, have more serious consequences with the systems here described than with those now followed.

TOPOGRAPHY AND STUMPS.

The acreage given for each system is for land that is level or gently sloping, and would have to be cut down for regions that are very hilly. It is also assumed that the land is practically free from stumps and sprouts.

SIZE OF FIELDS.

The size of the field, determining whether rows are long or short, has an effect on the number of acres that can be farmed per man and horse. The information on which all these cropping systems are based was gathered in regions where the fields are small to medium size, hence for large fields and long rows both men and teams could do somewhat better.

WEED MANAGEMENT.

Weeds are so common on every farm that they are generally accepted as necessary evils, and there is little appreciation of the far-reaching effect they have in reducing the area that can be farmed per man and team. The cost of weeds in a cotton field is much more than the cost of hoeing or than the loss entailed by the retarding of growth of cotton. They limit the area that can be farmed per man and mule, and in thus restricting they limit the size of the business and the income also.

The amount of labor with the hoe for May and June is somewhat more than half of all work on cotton during those months, and teams are busy only half to two-thirds of the time when men are busy all the time. At least this is the case where the number of hands is about equal to the number of work animals. Women and children, of course, are drafted into service during these months, but the point to be made clear is that any practices, implements, or kinds of management that can be put into effect to reduce the work with the hoe will enable the family to increase its crop acres and thus increase its

income. With good weed management there would be no need of women in the fields at this time.

In planning these cropping systems the work of chopping and hoeing was assumed to be the average under present practices; hence if the hoeing were reduced by any method whatever it would reduce the work for May and June, and thus permit the farmers to handle larger acreages or to handle one or two acres of Irish or sweet potatoes in addition to the regular crops.

It is well known that share croppers have a preference for growing cotton after cotton instead of after corn, because less hoeing is required, since less crab grass goes to seed in cotton than in corn fields. Crab grass is a serious nuisance in the cotton field, largely because it goes to seed freely in corn fields in previous years. The fact that corn is "laid by" much earlier than cotton accounts for this.

METHODS OF REDUCING HOEING.

A modern practice which helps to reduce the hoe work is to run a section harrow across the cotton rows before the crop is thinned. This may not be practicable if there is too much trash on the surface, but if the old cotton and corn stalks are well cut and are turned under deep there will be little trouble with trash on the surface. One of the advantages of planting cotton after cowpeas, soy beans, peanuts, or lespedeza is the fact that no trash is in the way and the young cotton can be cross-harrowed to the best advantage.

Another method by which some farmers reduce hoeing is to graze geese in the cotton fields. Whether the practice is advantageous from all standpoints or not, it is a fact that farmers who keep geese farm more acres of crops per hand than those who do not keep them. On 50 farms in Columbia County, Ark., the 30 farmers who kept geese raised 4 acres more crops per hand than those who did not keep them, and this was done in the face of the fact that 57 per cent of the cropped area was planted in cotton on the farms that kept geese as compared with 50 per cent on those that did not. Farmers estimate that 12 geese are equal to one hoe hand in keeping grass out of cotton. A danger connected with this practice, however, is that there is a tendency to depend too much on the geese and not keep the cotton as clean as it should be. It would seem that this was actually the case in Columbia County, where the 20 farmers who did not keep geese made 25 pounds more lint cotton per acre than those who kept them.

The old adage that an ounce of prevention is worth a pound of cure as applied in the matter of weed management is more effective than all the methods previously mentioned. Every well-kept nursery in the country is a standing demonstration of the effectiveness of preventing weeds from going to seed. Nurseries of young fruit trees usually stand three years, during which time no weeds are allowed to go to seed, and it is found that the first farm crop after nursery trees

is exceptionally clean. How to do this in ordinary farm practice is a question, but in system 5, for instance, it would be comparatively easy to prevent grass and weeds from going to seed by the following practices:

1. Keep corn clean and do not "lay by" too early.
2. Cut and shock corn as soon as ripe enough and disk the land immediately to destroy weeds. Then plant a winter cover crop on this land in September.
3. Give lambs, and sometimes sheep, the run of the cornfields in July and after.

During the first year of the rotation in system 5, when cotton occupies the land, it should be kept very clean, and a winter cover crop should be sown in the cotton "middles" in September.

During the second year of the rotation no troublesome weeds will ordinarily go to seed, because the land is broken in April and May and planted to cowpeas, which are harvested in August, after which the land is prepared for fall grains.

During the third year, when small grains followed by cowpeas occupy the land, it will be easy to manage so that few or no weeds will go to seed.

During the fourth year the corn, if handled as suggested, will leave the land practically free from weeds for the cotton of the following year.

PEAS OR NO PEAS BETWEEN CORN ROW?

The objection may be made that the plan of cutting and shocking corn and of disking the land immediately thereafter will prevent planting peas or other legume between the corn rows, because if the corn stubble were disked in late August or early September the legume would scarcely have made enough growth to warrant the expense for the seed. This objection would be valid if it were not that an abundance of legumes may be grown in Arkansas without planting cowpeas between the corn rows. The advantage of cutting and shocking corn and immediately disking the land is that much rough feed is thereby saved, a winter cover crop may be planted in season, and weeds and grasses are prevented from going to seed, all of which advantages are probably worth more than the interplanted cowpeas would be.

However, where corn rows are 6 to 7 feet apart a single row of cowpeas may be planted in each middle in June, and two more cultivations given, and if velvet beans are planted in the rows with the corn, then by the time the cowpeas are laid by the beans will quickly spread out and cover up and smother out young grass and weeds. This practice will prove satisfactory if the work is well done and at the right time, but in reality it will usually mean the growth of crab grass and the reseeding of this pestiferous annual.

SHEEP DESTROY WEEDS.

Sheep are extremely valuable as weed destroyers, and they can be shifted from field to field as crops permit, where they will clear up the fence rows. In some parts of the country it is common practice to turn the lambs, at weaning time, into the cornfields, where they destroy weeds, but do not injure the corn. Where the corn ears stand up fairly high sheep may be turned in after corn is laid by. They may eat an occasional ear that is down and they will trim up the lower blades of the corn, but they will not "ride" the stalks down as hogs do. The benefit which they thus render is much greater than the damage they do.

Temporary fencing made of poultry netting is convenient for confining sheep to specified areas, especially when this area is in corn, since the cornstalks serve very well as posts to which to tie the wire netting. Corner posts should, of course, be more substantial.

Sheep may be used also to destroy weeds in fields that are not planted in crops, along roadways, and in waste places, thus tending to clean up the whole place and reduce the weed seeds that may be blown in or tracked in on cultivated fields. Sheep are more convenient than goats for this purpose, since they are more easily confined.

EFFICIENCY OF MEN, TEAMS, AND IMPLEMENTS.

Some men and teams work faster and more regularly than others, and these differences make a great difference in the area they can cover. The acreages given for each of the foregoing systems are for the average workers and work animals, hence if men and teams are above or below the average in their ability to work, the acreages should be modified in each instance to suit the case. Also, it makes a difference whether one-horse or two-horse implements are used. The use of one-horse implements requires nearly double the man work and but a fraction less of horse work than the use of two-horse implements.

RELATION OF SYSTEMS TO FOOD PRODUCTION.

Present conditions require that yields be increased, that foodstuffs be raised in abundance, and that the supply of fats and proteins, vegetable and animal, be increased.

The various crop systems above described meet these requirements in somewhat different measure. Some are well calculated to increase soil fertility and the yield of crops, and some are not. Some are high in food production and some are low. Some are well adapted to the production of meat, milk, etc., and others are not. It may be taken for granted that in most cases the farm should raise all the feedstuffs that are consumed on the farm, unless possibly some concentrates are bought to balance the corn, hay, and roughage grown, and it may also be assumed that each farm should produce an abundance of

vegetables, fruits, milk, meat, butter, poultry, eggs, sweet corn, and peas for the use of the family. It is, of course, assumed that certain vegetables and fruits will be grown in the home garden, a most important supplement to any crop system that may be adopted; also that improved pastures will be provided. Even with these additional sources of food supply, however, system 1 would be lacking in the matter of furnishing home supplies, whereas system 5 would furnish all these things in large measure. Indeed, the latter system would not only furnish enough food and feed for the family, but would furnish a surplus for market.

Some kind of live stock, of course, should be kept to consume the surplus feed which some of these systems supply. In system 5, for instance, if the oats were fed to the team, all the corn and part of the peas could be used to produce pork. A few cows could also be kept to consume cowpea hay, and some dairy products could be sold. Such a system would produce all the cotton that an average family could pick, food and feedstuffs for home use, and other crops or animals and animal products to be marketed, and would thus constitute a well-rounded system of farming.

RELATION OF SYSTEMS TO LABOR REQUIREMENTS.

It is a matter of great importance that men and teams be kept reasonably busy at profitable work, and if we consider the various systems from this standpoint we find that some are better than others. Cotton requires little team work after the 1st of August, but a great deal of man, woman, and child work, and thus system 1, in which two-thirds of the land is occupied with cotton, is markedly inefficient in its use of horses and mules. Some of these systems distribute the work of men and teams over the year very evenly, but in others, as, for instance, in systems 1 and 2, the seasonal distribution of labor is poor. August is entirely unoccupied under several systems, but is partly used or occupied in systems 5, 6, 9, and 10.

More acres are farmed per man and mule under some systems than under others, yet the systems in which most acres are farmed are those which stand high from the standpoint of increasing fertility. Under system 3 a farmer can farm 25 per cent more land than under system 1 and keep it in a higher state of fertility. Also, under system 5 two men and a team can easily farm 50 acres, as compared with 40 acres under system 2, make the land richer at the same time, and probably increase the average production of cotton per family.

High production per acre, high production per man, plenty of food for home use, and a high efficiency of man and mule labor are to be attained through following, not necessarily precisely, the systems here outlined, but at least the principles upon which the approved systems presented have been based.

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